Display

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At the end of this Session, you will be able to:

- Define each of the following display wiggle types : variable area, variable density, dual polarity & wiggle only.
- Define the term 'bias' in the context of display processing.
- Describe at least 2 ways in which bias can affect the appearance of seismic data on displays.
- Define the term 'amplitude clipping' in the context of display processing.
- Define the term 'plotting resolution' in the context of seismic display.
- Describe at least 2 ways in which dot size can affect the appearance of seismic data on displays.
- Define the term 'trace polarity' in the context of display processing.
- Define the SEG seismic trace polarity convention.

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At the end of this Session, you will be able to:

- Describe the factors that influence the selection of plot direction for a given display.
- Describe how selection of horizontal plot scale is influenced by each of the following factors : plot size, resolution, trace spacing & client objectives.
- Describe how selection of vertical plot scale is influenced by each of the following factors : plot size, resolution, data length & client objectives.

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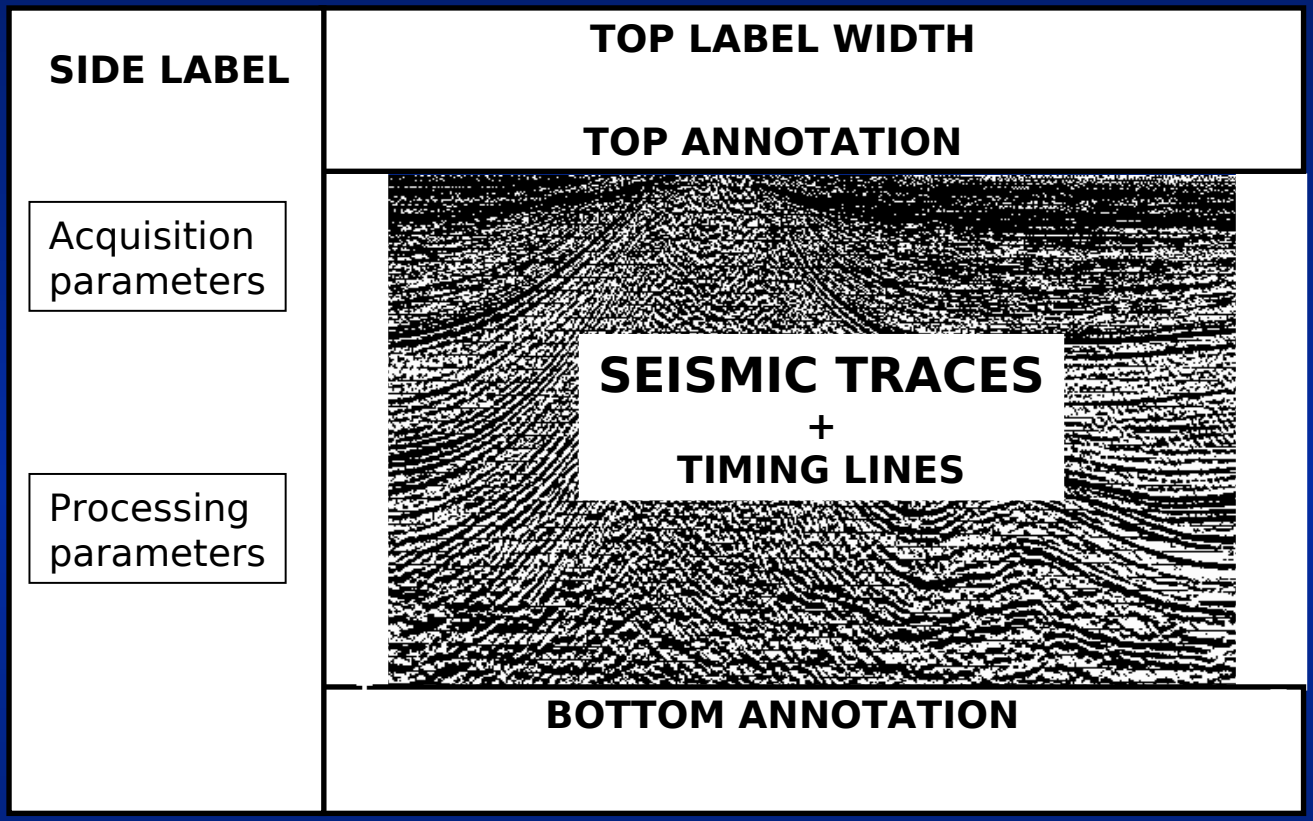
Display Components



Display Devices

1. Thermal online plotter
2. Laserdot online plotter

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Display Scale

Horizontal Scale

It is usual to produce final displays at a scale which is comparable with survey maps.

This enables direct transfer, or mapping, of information such as the location of particular structures, eg. a salt dome, or a fault, without the need for cumbersome recalculations of position.

Most commonly used horizontal scales are:
1:12500, 1:25000 and 1:50000

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Display Scale

Horizontal Scale

What is meant by a horizontal scale of 1:25000 (or 1 is to 25,000)?

It means that 25,000 units in reality are being represented by 1 unit on paper.

Scale is independent of any measuring system. It is the ratio of real distances versus their paper representation.

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Display Scale

Exercise 1:

If we wanted to display a stack or migration section at a horizontal scale of 1:25000. The trace interval is 12.5m. What is the horizontal scale in terms of trace per centimetre to plot the data?

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Display Scale

Vertical Scale

Horizontal to vertical scale ratios of approximately 1:1 are most helpful when making a structural interpretation.

But considerable vertical exaggeration is often used for a stratigraphic interpretation.

The vertical scale is expressed in terms of **inches or centimeter per second.**

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Display Scale

Exercise 2:

You wanted to produce non-exaggerated display for your data. The scale has decided as 1:25000. If you been provided with the data model as above than what is the most suitable vertical scale plotting will be?

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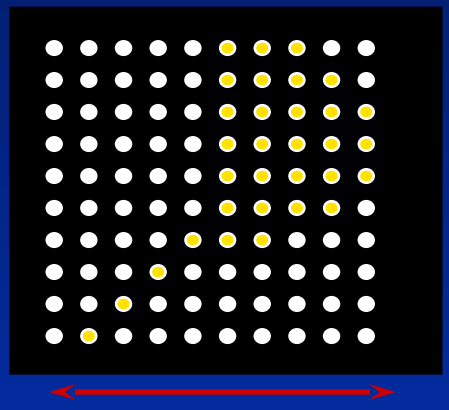
Plotting Resolution

A seismic plot is built on a dot matrix, each dot being either on or off.



The density of the dots within the matrix is called the resolution of the plot. Resolution is measured in dots/unit.

There are many types and makes of plotters having different resolutions and plotting widths. It is therefore important to direct our displays to a suitable plotter to satisfy imaging requirements.

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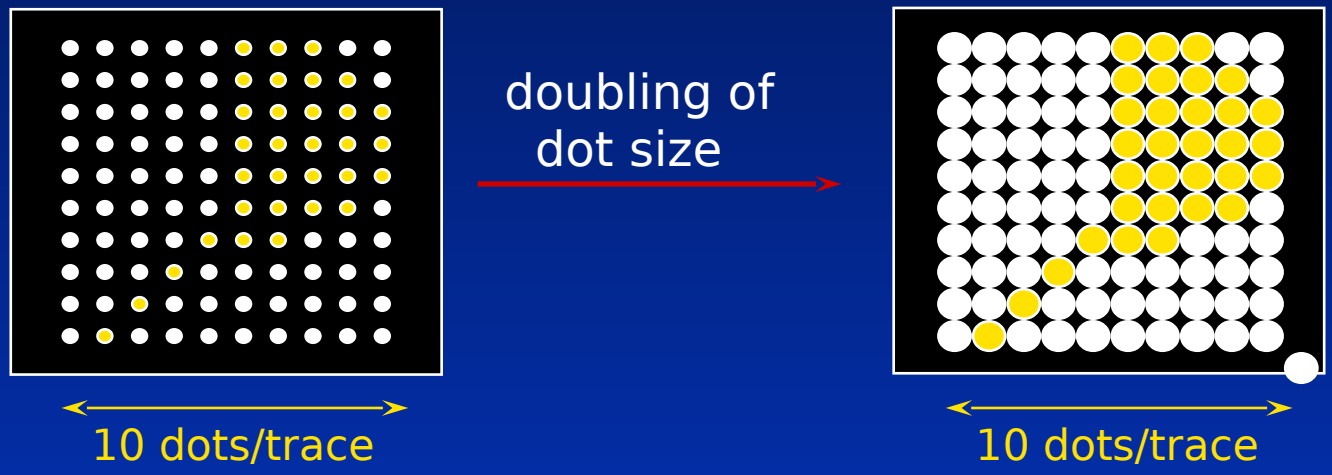
Plotting Resolution



If the dot size is increased, the effect is to make the seismic trace look smoother and more continuous. Too large a dot however results in loss of resolution.

A dot diameter ~ 1.5 - 2 times the dot spacing is normally satisfactory.

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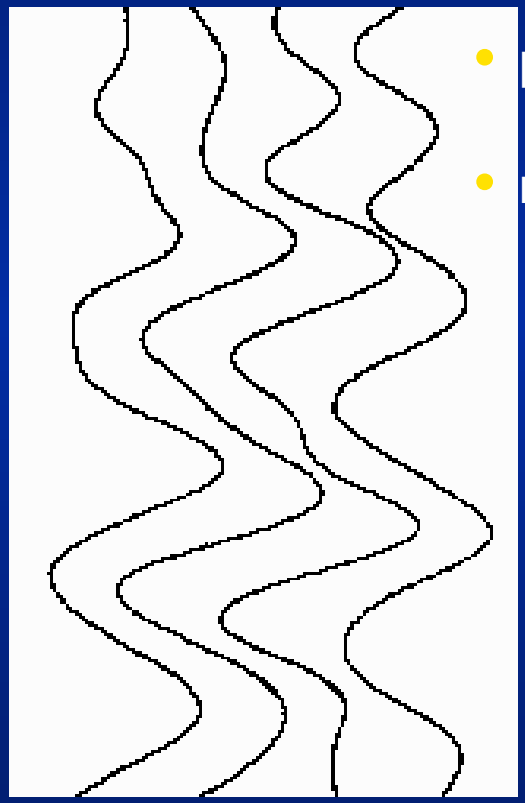
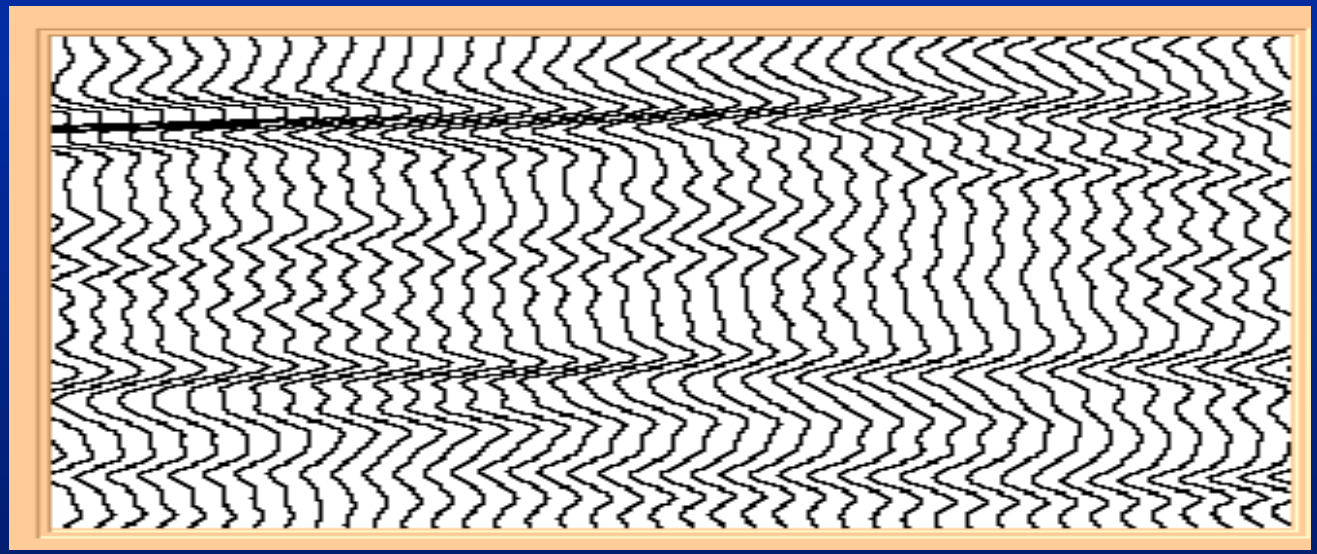
Modes of Display

Wiggle mode (W)

- graph of amplitude as a function of time
- positive and negative values treated in the same way
- may be used for fine detail work by interpreters





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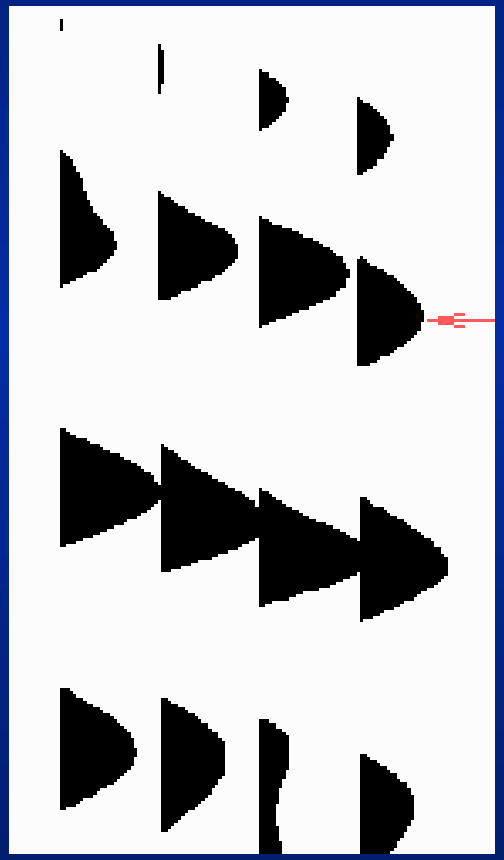
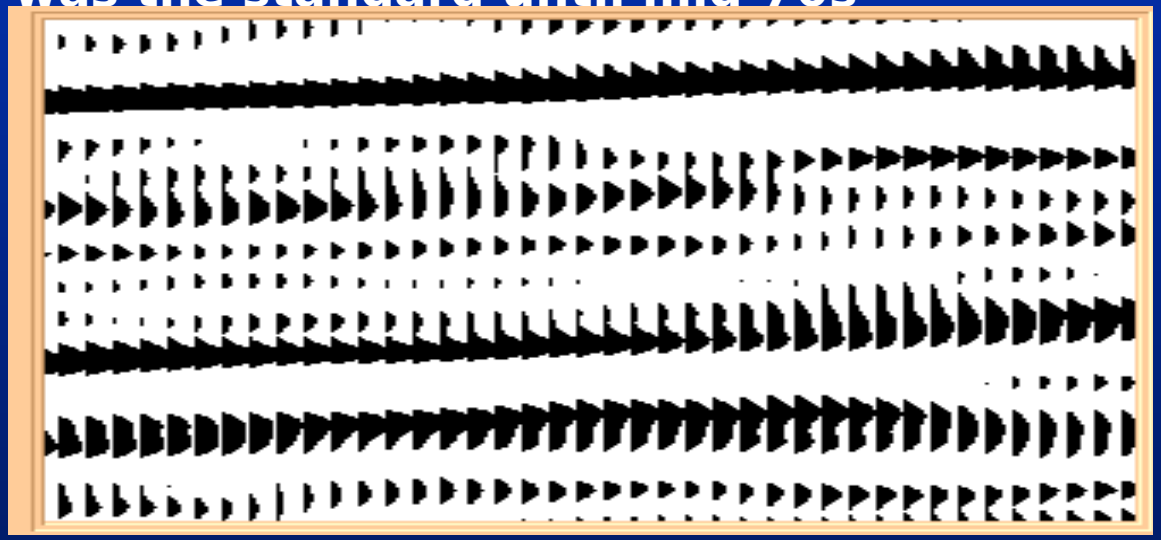
Modes of Display

Variable Area mode (VA)



- positive amplitudes displayed as solid black
- negative values not represented
- makes coherent events more evident
- was the standard until mid-70s



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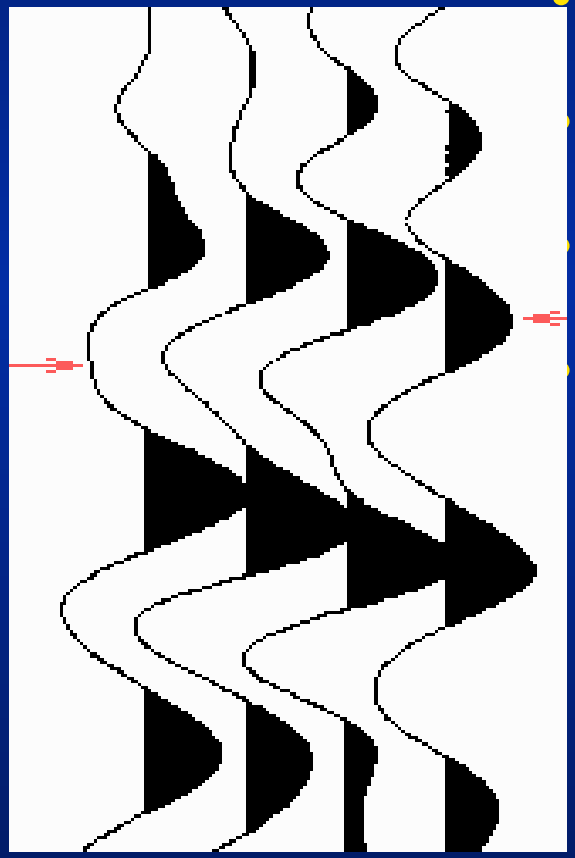
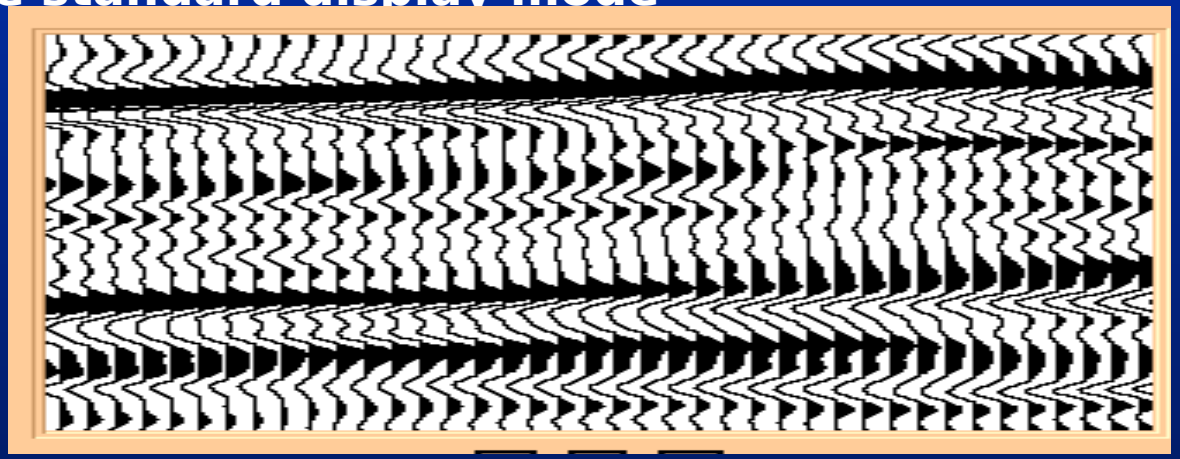
Modes of Display

Variable Area / Wiggle mode



- positive amplitudes displayed as solid black
- negative values displayed as continuous wiggle
- enhances coherent events and preserves detail
- the standard display mode



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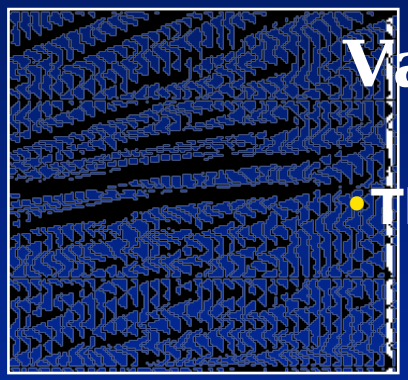
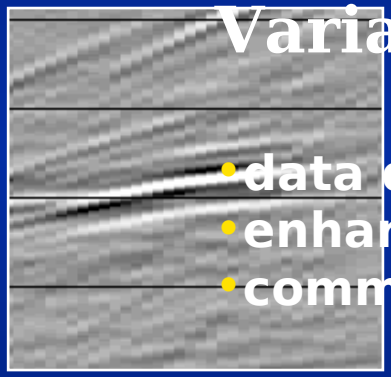
Modes of Display



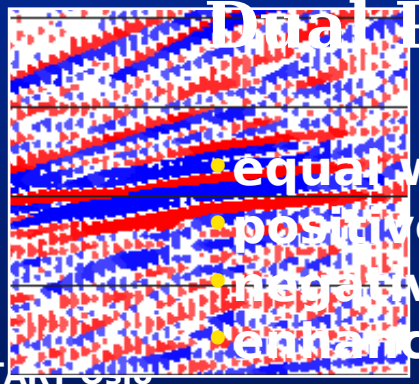
Variable Area with Wiggle

- The standard display mode



Variable Density

- data displayed with density proportional to amplitude
- enhances both positive and negative events
- common display mode for timeslices



Dual Polarity

- equal weight given to positive and negative amplitudes
- positive amplitudes often displayed as red
- negative amplitudes often displayed as blue
- enhances positive and negative events

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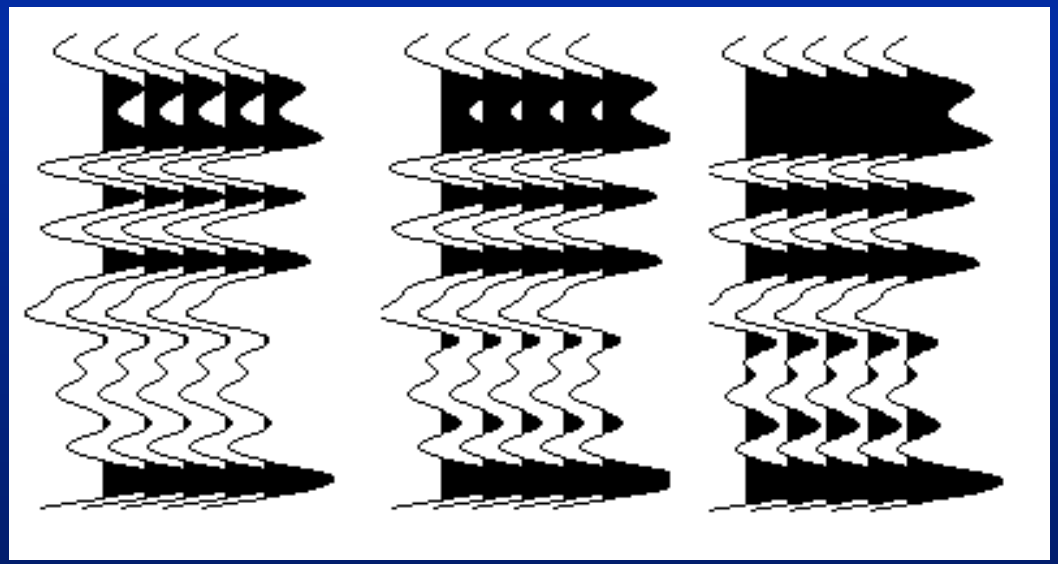
Display bias

oves the zero amplitude level away from the centre of the trace widt

ositive bias enhances the effect of the negative amplitude

negative bias enhances the effect of the positive amplitude

bias = +30% *bias = 0%* *bias = -30%*



Normally, Zero bias is used

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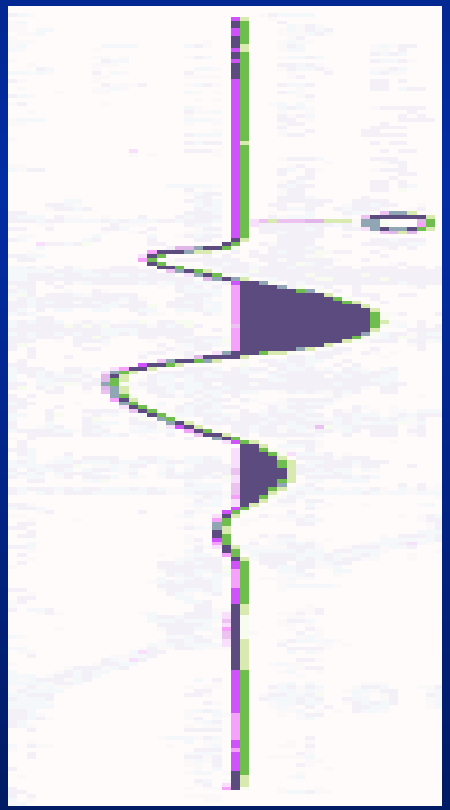
Display polarity

The SEG standard is that a positive pressure or upward motion is represented by a **negative number**.

i.e. data ‘first breaks’ start with a negative ‘white’ trough.

Positive reflections are therefore plotted as white troughs.



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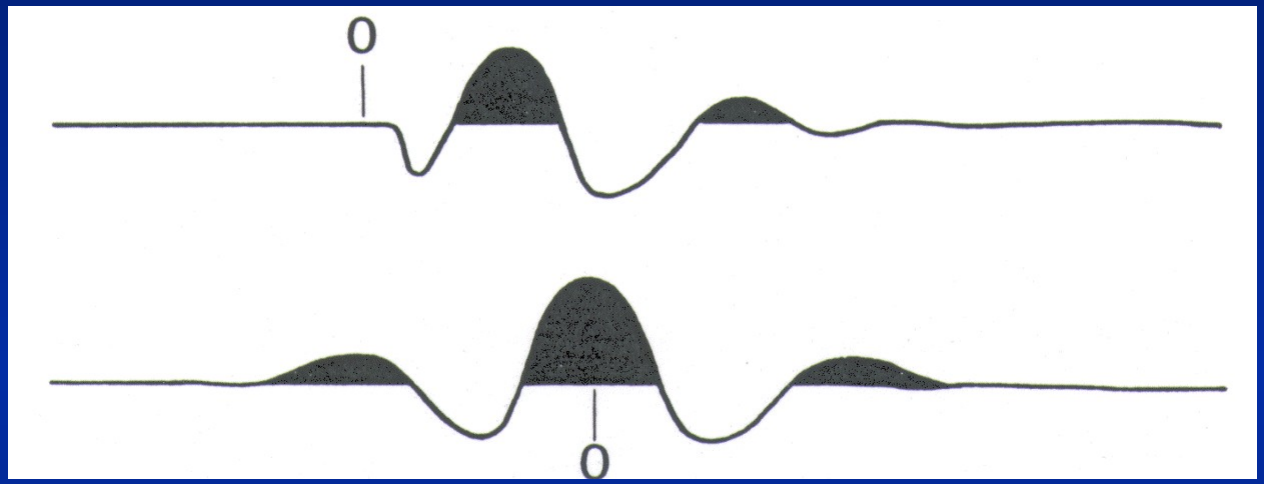
SEG Polarity Convention



For a positive reflection :

- **minimum-phase wavelet (top) begins with a down kick**
- **centre of a symmetrical (zero-phase) wavelet is a peak**

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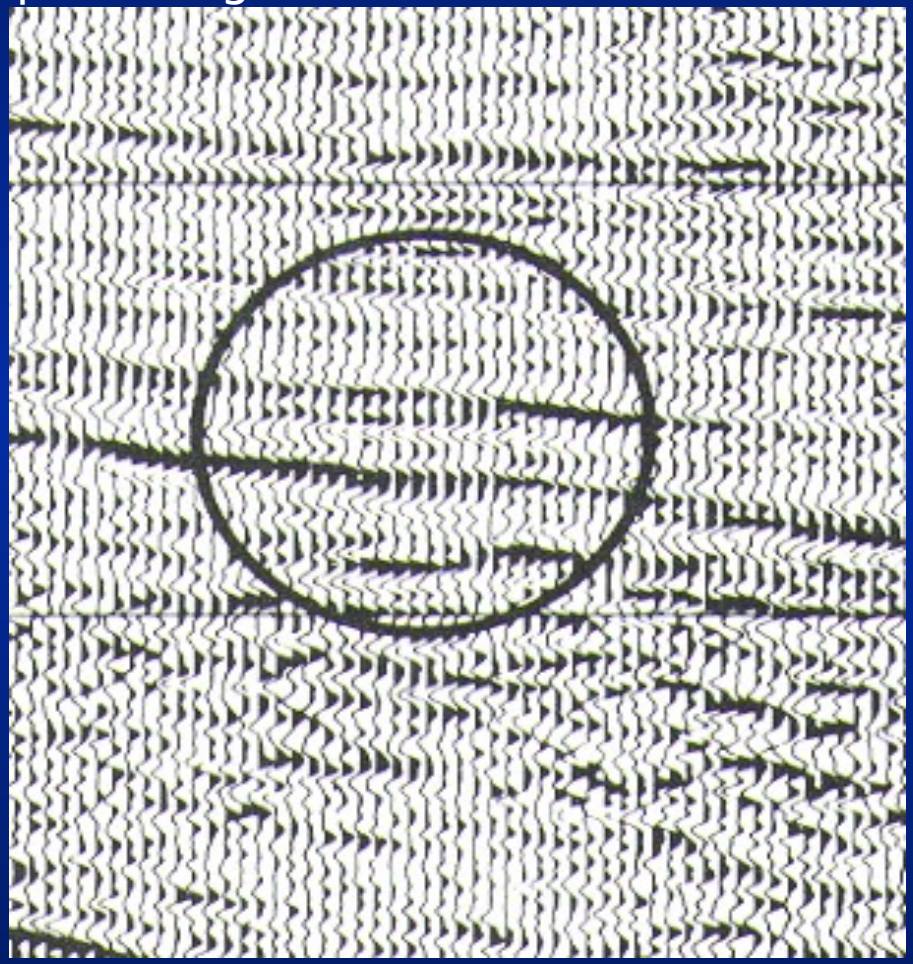
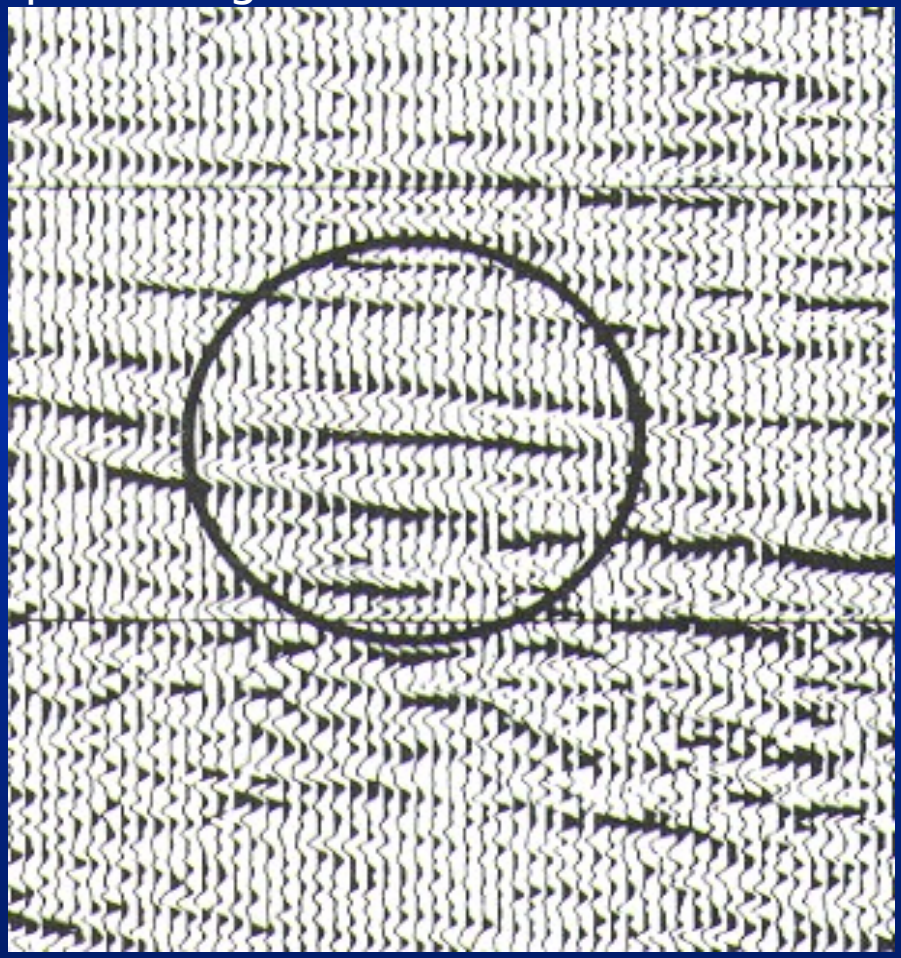
Display polarity

Normal polarity
positive gas-fluid reflection is ‘white’



Reverse polarity
positive gas-fluid reflection is ‘black’



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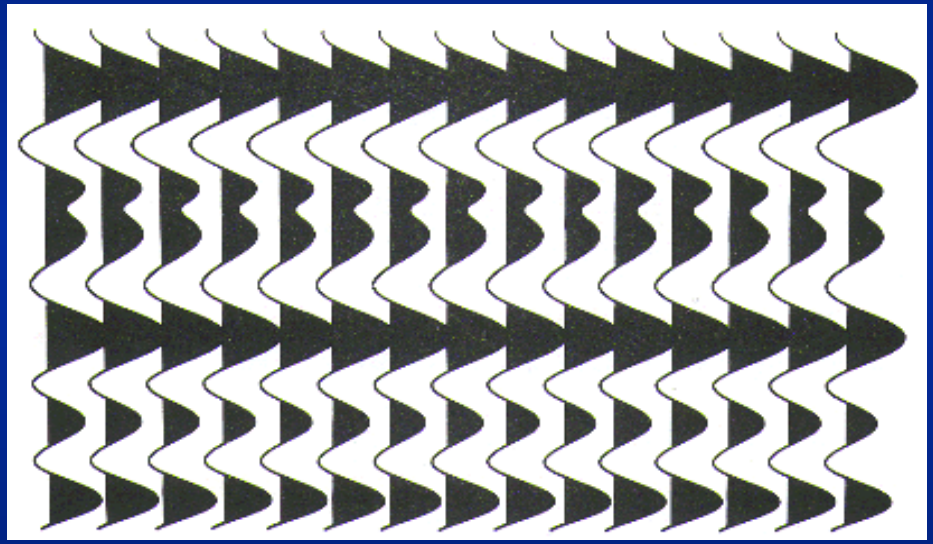
Display gain

The seismic display will ideally show good continuity of the signal but not the noise.

To do this the traces must overlap when plotted to give continuous black bands across the section.



Normally the type of gain used is based on dB values in association with other information such as: Normalisation Amplitude, Amplitude Excursion and Clipping Excursion level

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Display Gain

Normalisation Amplitude:

Each input trace amplitude (y) is scaled so that the plotted excursion from
the zero line is given by

$$= \quad \mathbf{Py / A}$$

where,

y = trace amplitude
P = value of amplitude excursion/dB
A = desired normalisation amplitude (usually 2000)

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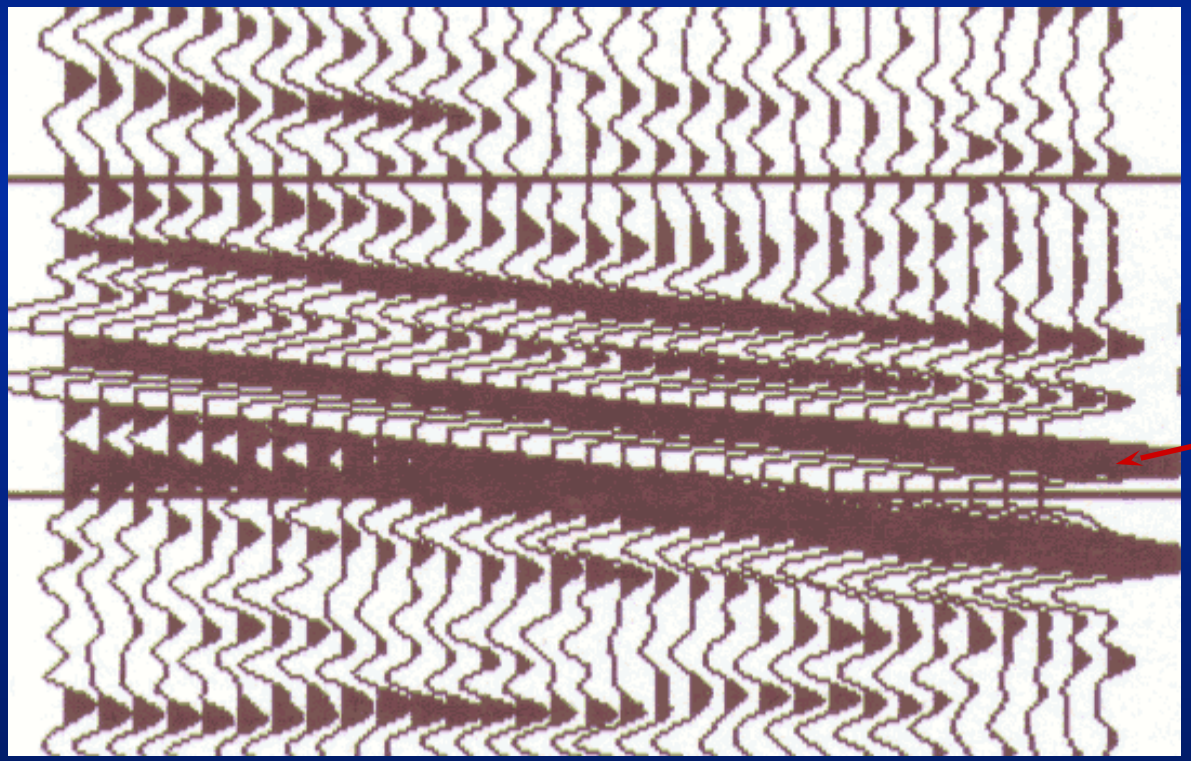
Clipping Excursion

Some degree of trace clipping is normally used to prevent very high amplitude data distorting surrounding traces.

It is often set so that the trace may span only twice the trace width before being clipped.



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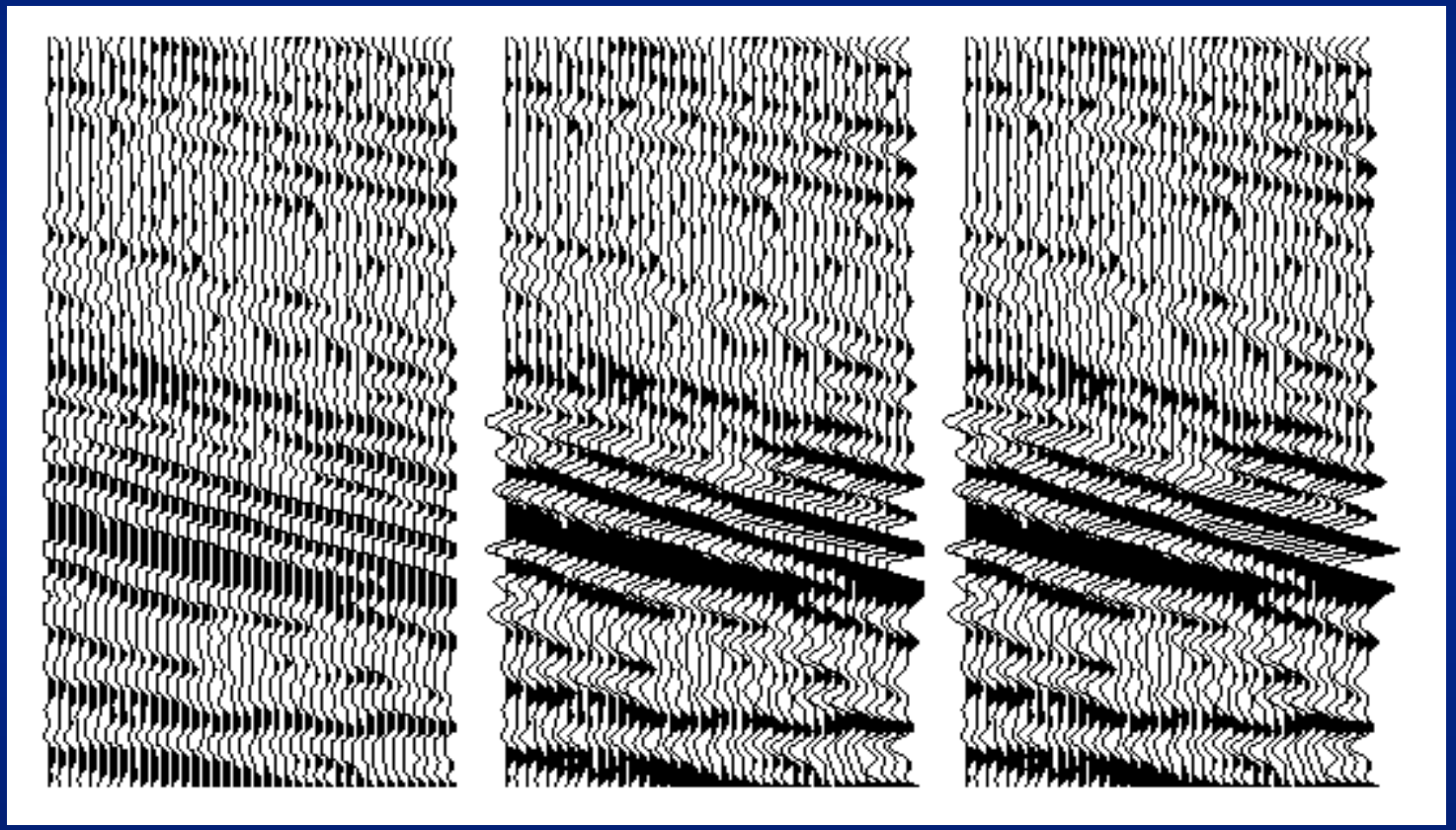
Examples of Clipping Excursion

Increasing excursion value



0.5 **1.0** **3.0**

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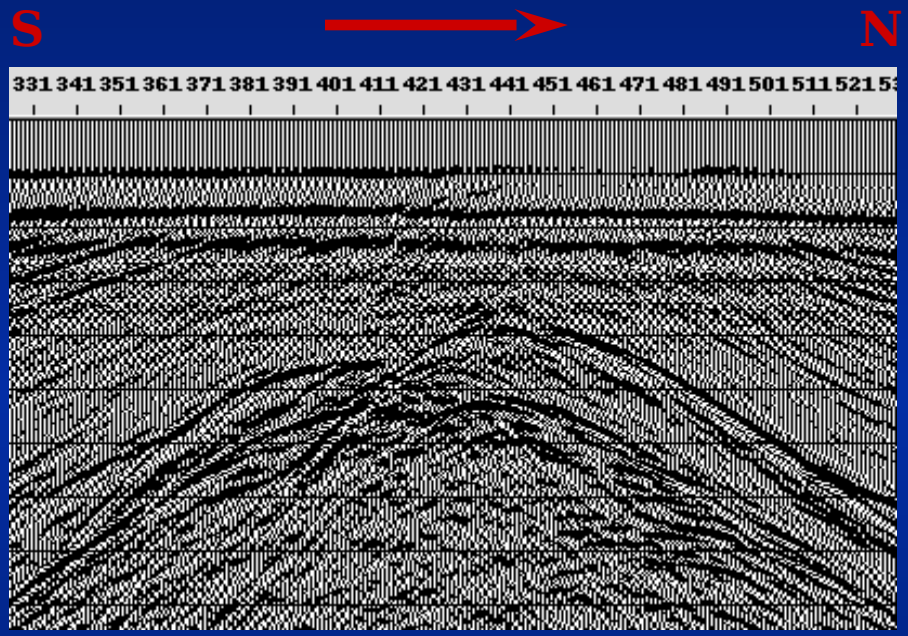
Plotting Direction

North and/or East is always on the right of a seismic display



A line shot with a bearing of 245degrees the data will be displayed from right to left

A line shot with a bearing of 78degrees the data will be displayed from left to right

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3D Display

A significant amount of time and effort is allotted to monitoring
the progress of 3D processing and performing extensive **quality**
control checks of the output.

Any data errors not identified during QC will persist through to
contaminate the 3D stack and migration datasets.
For example consistent timing or offset errors will usually be
clearly visible at the stack QC stage, but by then it is too late.

QC displays like **near trace gathers, selected shot**

3D Display

Near trace plots - checking the shot firing sequence, noise problems, positioning error…

Linear Moveout - checking positioning error

Near trace time slice - checking timing discontinuities across 3D grid, positioning error, tidal variation…

Coverage plot - checking fold coverage during 3D processing

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3D Display

Crossline - checking positioning error, tidal variation, amplitude variation

Inline - to ensure data quality matches up to that expected from pre-stack trial.
spikes and severe noise problem

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Timeslice

Time slice is a display of seismic measurements corresponding to a single arrival time

- more powerful than crossline display as the entire 3D grid is seen on a single display. To quality control 3D stack and migration cube, 3D stacking velocity and migration velocity, positioning error, tidal variation, amplitude variation….

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